"THE EQUATION OF EXCHANGE" FOR 1912, AND FORECAST

In the March number of this REVIEW I published preliminary calculations for " 'The Equation of Exchange for 1912,' and Forecast." The present is a more complete calculation based on subsequent statistics for the price level and volume of trade.[1]

Unfortunately it is impossible to construct estimates for the volume of trade as accurate as those for previous years, because the Bureau of Foreign Commerce of the Department of Commerce and Labor has been compelled, for lack of appropriations, to discontinue its detailed statements (in the *Monthly Summary of Commerce and Finance*) of the internal commerce of the United States which hitherto have formed the chief basis for my statistics of the volume of trade.

I greatly deplore the cessation of these statistics, and I should like here to record the hope that economists may in some way contrive to secure much more complete and reliable figures than any hitherto available, for the changes in *quantities* as distinguished from the changes in *money values* of goods produced, exchanged, and consumed. For generations economists have been compiling statistics of index numbers for prices, but almost no attention has yet been paid to the equally important statistics for index numbers of *quantities of goods*, and particularly for the volume of trade. The main question before us at the present time as to the high cost of living, is whether we are suffering from an excess of media of exchange or from a deficiency in actual goods. This vital question will be settled very largely on the basis of better statistics concerning the quantities of goods.

Since, however, the cessation of the figures for internal commerce did not occur until July, 1912, it is still possible to use the figures for the first six months of 1912, and to compare these with the corresponding figures for the first six months of 1911. One half the "weight" is assigned these half-year comparisons as was assigned the full-year comparisons employed in previous years. The same procedure has been adopted with respect to the statistics of car movements, the figures for which, in the *Monthly Summary of Commerce and Finance*, also cease after the first six months

[1] As in previous years, I am under obligation to the Bureau of Labor for kindly providing me, in advance of publication, with their newly calculated index number for the last calendar year.

of 1912. The volume of trade computed in this way was 14 per cent greater than in 1911. This is more than the figure used in the preliminary estimates of March, where, as a rough and ready measure of the volume of trade, was taken the median percentage increase for the following nine items: cotton production, oats, railroad gross earnings, tobacco, rye, wheat, corn, pig iron, and barley—the cotton showing a decrease and all the others an increase in the order given. The median of these nine was an 8 per cent increase. Inasmuch as the 14 per cent obtained by the more laborious method here used is based this year chiefly on only half-year data, I have thought it worth while to give some weight to the 8 per cent in the March computation, and have chosen 12 per cent as a fair average of both computations.[2]

So far as the above-named changes permit, the methods of calculation of the figures in the equation of exchange are as similar as possible to those employed in previous years[3].

[2] This average is, of course, a matter of judgment. Possibly 13 per cent would be as fair; 11 per cent, on the other hand, would certainly be too low, as it would give as much weight to the very rough figures of the earlier calculation as to the more extensive figures of the later calculation. Although the earlier estimate of 8 per cent better fits into the equation of exchange than the latter estimate of 14 per cent, this fact must be set down to accident rather than to any superiority of method.

[3] The exceptions are in the calculations for the price level (P) and the volume of trade (T). In computing the price level (P), the statistics for the average prices of stocks were taken from Babson's desk sheet instead of from the calculations of Professor Mitchell, which were not available in time for use in this article.

The following explanation will indicate the difference between the calculations for T this year and last year. The increase of internal commerce in the United States for the first half of 1912, compared with the first half of 1911, is found (by the same method as employed last year for full years) to be 16 per cent. As explained in the text, figures for the last half of 1912 are not available. The increase in the qualities of imports into the United States for the whole year 1912, compared to the whole year 1911, by the same method as employed last year, is found to be 18 per cent and that for exports, 12 per cent, making an average for exports and imports of 15 per cent. The increase in the stocks sold on the New York Stock Exchange, taking the figures from Babson's desk sheet, was 3 per cent and the *decrease* in the car service for the first half of 1912, as compared with the first half of 1911, was found from the *Monthly Summary of Commerce and Finance* to be 8 per cent. In former calculations, the "weighting" for the above-named figures was: 20 for internal commerce, 3 for exports and imports, 2 for car movements, and 1 for stock transactions. But for 1912, taking account of the fact that the statistics for internal commerce and for car movements, permit comparisons only between the

Inserting the figures thus calculated for the six magnitudes in the equation of exchange, we find that the two sides of the equation of exchange agree within about 4½ per cent. This discrepancy is greater than that found in most previous years. Last year and the year before, the two sides of the equation agreed within 1 per cent. The relative lack of agreement this year is, of course, ascribable to the incompleteness of the figures for the volume of trade. Accordingly, the chief adjustment or correction of the originally calculated values was made in the figure for the volume of trade. Of the 4 ½ per cent of adjustment required, the left side was increased by less than 1 per cent and the right side decreased by nearly 4 per cent. The main part of the adjustment on the left side was made in the velocity of circulation and the main part of the adjustment on the right side was made in the volume of trade. The changes were as follows:

The figure for M (the money in circulation in the United States, exclusive of that in the United States Treasury and banks) was changed from the originally calculated 1.70 billions to 1.71 billions of dollars.

The figure for V (the velocity of circulation of this money) was increased from the originally calculated 21.8 times a year to 22.0 times a year.

The figure for M' (the bank deposits immediately subject to check) was increased from the originally calculated 8.15 billions to 8.17 billions of dollars.

The figure for V' (the "velocity," "rate of turnover," or "activity" of deposits) was increased from the originally calculated 53.0 times a year to 53.4 times a year.

The figure for P (the level of prices in the United States in 1912, compared with the level of 1909 taken as the base year) was decreased from the originally calculated 105.8 per cent to 105.3 per cent.

The figure for T (the volume of trade, or the number of "units" of goods of all kinds exchanged for money or checks in 1912—each unit of goods being, not a bushel, quart, or pound, but *that amount of any commodity which was worth one dollar in 1909*)

first half of 1912 and the first half of 1911, the weights here used are: 10 for internal commerce, 3 for exports and imports, 1 for car movements, and 1 for stock transactions. The average of the percentage changes on this basis proves to be an increase of 14 per cent. This, as explained in the text, was reduced to 12 per cent by giving some consideration to the 8 per cent found in the March computation by a different and much rougher method.

was decreased from the originally calculated 463 billions to 450 billions.

These modifications make the figures mutually agree and we have the following result:

Circ. of money (38)	+	Circ. of checks (436)	=	Value of trade (474)
Money (M) × its velocity (V)	+	Deposits (M') × their veloc. (V')	=	Price lev. (P) × vol. trade (T
1.71 × 22	+	8.17 × 53.4	=	105.3 × 450.

As stated in previous publications, it is important to remember that all these estimates are subject to some error. This is especially true for the present statistics because of the imperfect data for the volume of trade. Yet the cumulative or net error in the six magnitudes is only a 4½ per cent discrepancy between the two sides of the equation. My own impression is that the statistics for money (M) and deposits (M') are probably correct within 1 per cent; those for velocity of circulation of deposits (V') and for price level (P) within 2 per cent, and those for the velocity of circulation of money (V) and the volume of trade (T) within 5 per cent.

Comparisons with the preliminary figures given in March will show that the only changes worth noting are a reduction in the figures for P, the price level, of about 2 per cent and an increase in the figures for T, the volume of trade, of about 3 per cent.

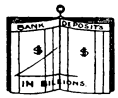
Comparing the figures as we have found them for 1912 with those for 1911, we find: that the quantity of money in circulation has increased in one year from 1.64 billions to 1.71 billions or about 4 per cent; that the volume of deposits subject to check has increased from 7.78 billions to 8.17 billions or about 5 per cent; that the velocity of circulation of money has increased from about 21 to about 22; that the velocity of circulation of deposits subject to check has increased from 49.9 to 53.4 or about 7 per cent; that the price level has risen from 102.2 to 105.3 or about 3 per cent; and that the volume of trade has increased from 413 billion units to 450 or about 9 per cent. As remarked in the March number, these results justify in almost every detail the prediction of general expansion made a year ago. Since the March article was written, there have been striking evidences of the tendency of credit toward inflation. These have been noted in many quarters of the world such as Germany, Canada, England and the United States and have led to considerable discussion as to the so-called "scarcity"[4] of gold.

[4] For a brief statement of the fallacy in the theory that gold is "scarce,"

The weight 

symbolizing a purse, represents M, the money in circulation in the United States (i. e. all money outside of the U. S. Treasury and the banks). It is usually between one and two billions.

The leverage of this purse, or its distance from the fulcrum, represents V, the velocity of circulation of money. Money usually turns over about twenty times a year.

The weight 

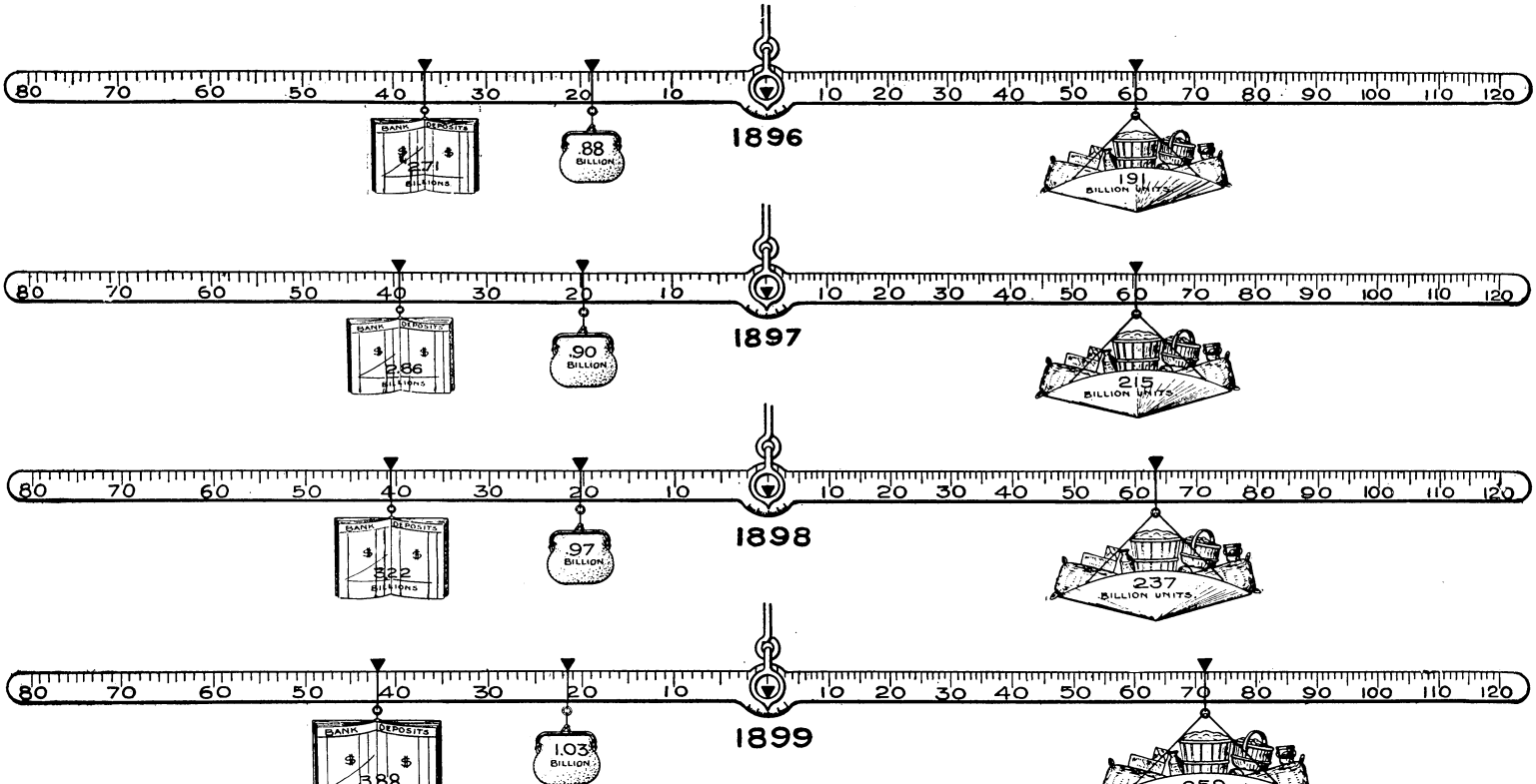
symbolizing a bank book, represents M', the bank deposits against which checks are drawn (usually from three to eight billions).

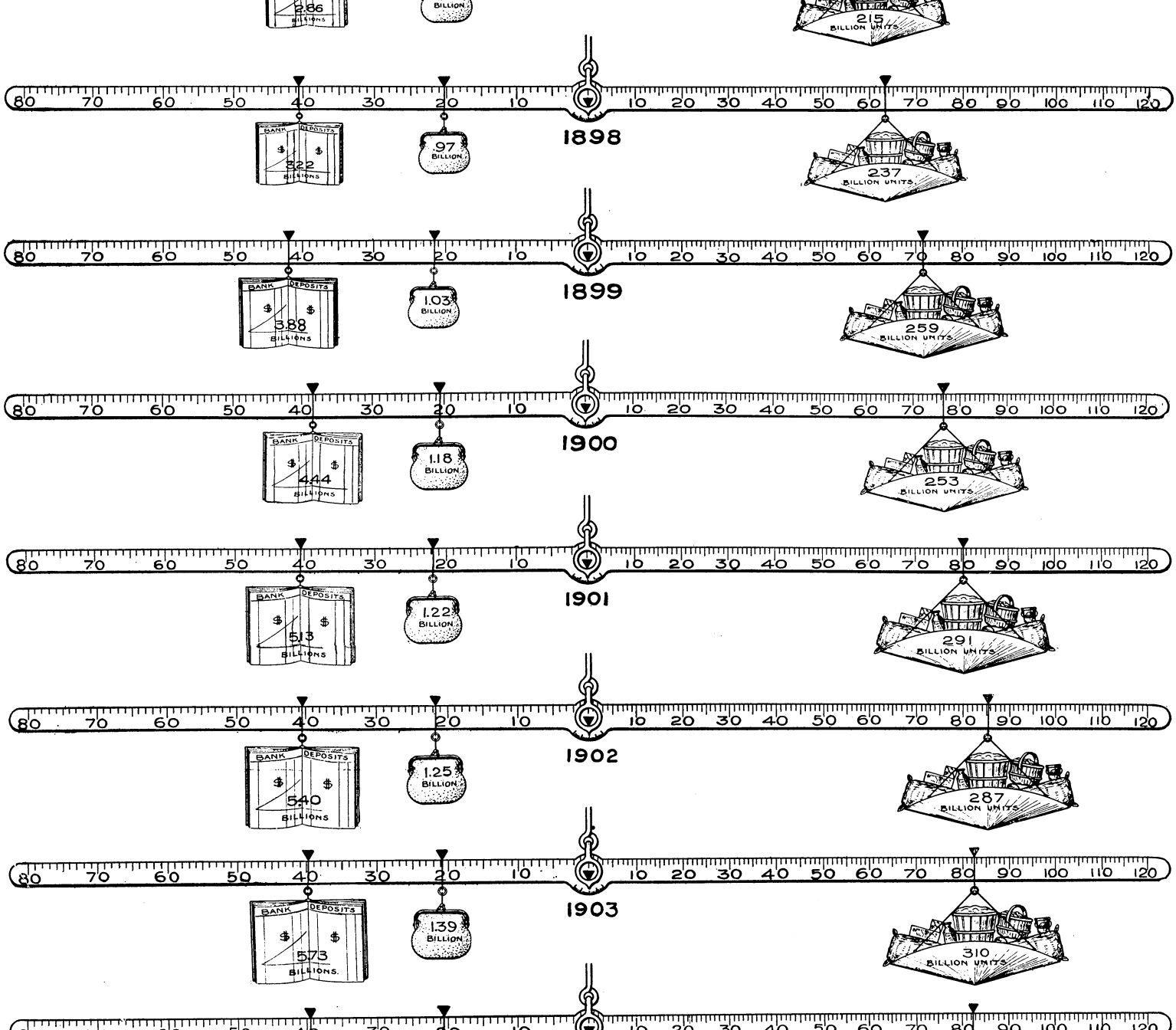
The leverage of this bank book represents V', the velocity of circulation ("activity") of these deposits. The deposits are usually turned over from forty to fifty times a year.

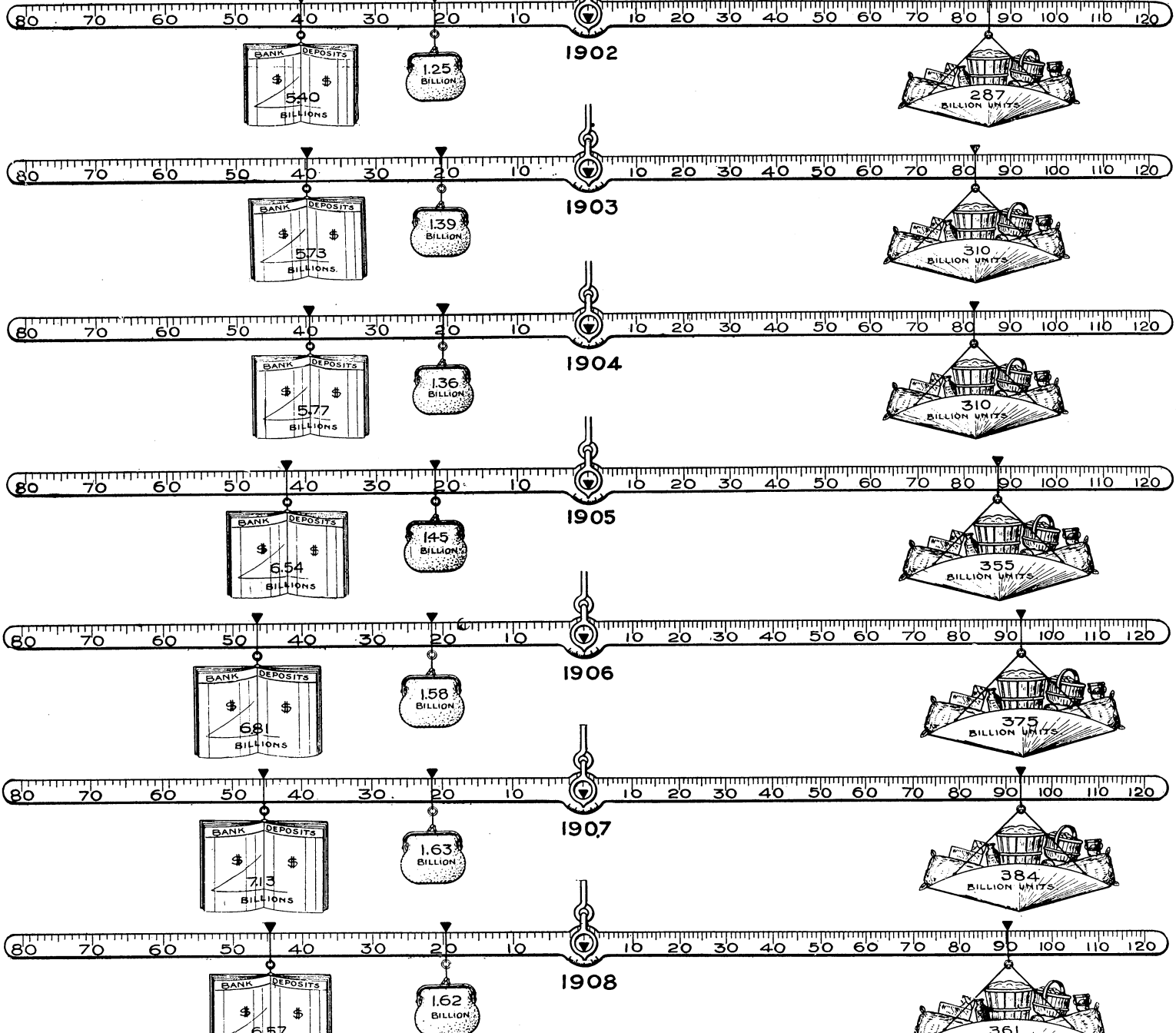
The weight 

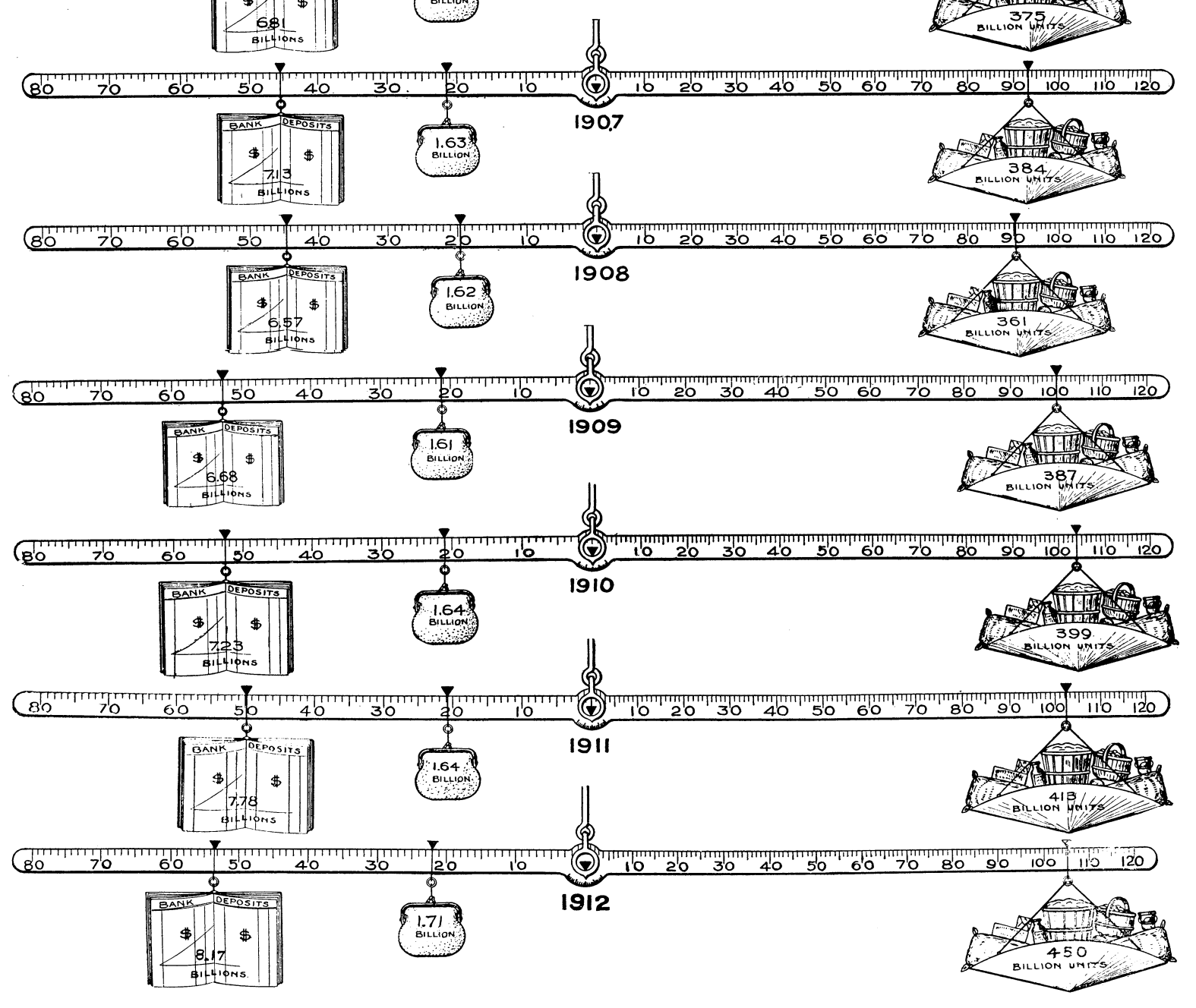
symbolizing a grocer's tray, represents T, the volume of trade expressed in "units," each "unit" being the quantity which could be purchased for $1 in 1909.

The leverage of this tray represents P, the index number of prices measured as a percentage of the prices of 1909.




2.86
BILLIONS
.86
BILLION
215
BILLION UNITS
80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120
1898
BANK DEPOSITS
$ $
322
BILLIONS
.97
BILLION
237
BILLION UNITS
1899
BANK DEPOSITS
$ $
3.88
BILLIONS
1.03
BILLION
259
BILLION UNITS
1900
BANK DEPOSITS
$ $
444
BILLIONS
1.18
BILLION
253
BILLION UNITS
1901
BANK DEPOSITS
$ $
513
BILLIONS
1.22
BILLION
291
BILLION UNITS
1902
BANK DEPOSITS
$ $
540
BILLIONS
1.25
BILLION
287
BILLION UNITS
1903
BANK DEPOSITS
$ $
573
BILLIONS
1.39
BILLION
310
BILLION UNITS


80 70 60 50 40 30 20 10 0 10 20 30 40 50 60 70 80 90 100 110 120
1902
BANK DEPOSITS
$ $
540
BILLIONS
1.25
BILLION
287
BILLION UNITS
1903
BANK DEPOSITS
$ $
573
BILLIONS
1.39
BILLION
310
BILLION UNITS
1904
BANK DEPOSITS
$ $
577
BILLIONS
1.36
BILLION
310
BILLION UNITS
1905
BANK DEPOSITS
$ $
654
BILLIONS
1.45
BILLION
355
BILLION UNITS
1906
BANK DEPOSITS
$ $
681
BILLIONS
1.58
BILLION
375
BILLION UNITS
1907
BANK DEPOSITS
$ $
713
BILLIONS
1.63
BILLION
384
BILLION UNITS
1908
BANK DEPOSITS
$ $
657
BILLIONS
1.62
BILLION
361
BILLION UNITS


BANK DEPOSITS
$ $
6.81
BILLIONS
1.63
BILLION
375
BILLION UNITS
80 70 60 50 40 30 20 10 10 20 30 40 50 60 70 80 90 100 110 120
1907
BANK DEPOSITS
$ $
7.13
BILLIONS
1.63
BILLION
384
BILLION UNITS
80 70 60 50 40 30 20 10 10 20 30 40 50 60 70 80 90 100 110 120
1908
BANK DEPOSITS
$ $
6.57
BILLIONS
1.62
BILLION
361
BILLION UNITS
80 70 60 50 40 30 20 10 10 20 30 40 50 60 70 80 90 100 110 120
1909
BANK DEPOSITS
$ $
6.68
BILLIONS
1.61
BILLION
387
BILLION UNITS
80 70 60 50 40 30 20 10 10 20 30 40 50 60 70 80 90 100 110 120
1910
BANK DEPOSITS
$ $
7.23
BILLIONS
1.64
BILLION
399
BILLION UNITS
80 70 60 50 40 30 20 10 10 20 30 40 50 60 70 80 90 100 110 120
1911
BANK DEPOSITS
$ $
7.78
BILLIONS
1.64
BILLION
418
BILLION UNITS
80 70 60 50 40 30 20 10 10 20 30 40 50 60 70 80 90 100 110 120
1912
BANK DEPOSITS
$ $
8.17
BILLIONS
1.71
BILLION
450
BILLION UNITS

The following are the 1912 figures for the derivative magnitudes calculated as in previous years: The percentage of money expenditure to total expenditure[5] ($MV \div MV + M'V'$) is equal to $38 \div 474$ or 8 per cent, while the check expenditure was 92 per cent. These are substantially the same as in 1911. The ratio of deposits relatively to money, $M' \div M$, was $8.17 \div 1.71$, or 4.8, as against 4.7 for 1911. The "virtual velocity of money" including money in banks, or $MV + M'V' \div M + R$ where R stands for Money in Banks, *i.e.*, the quotient of the total expenditure (by money and check) divided by the total money in use (both that in circulation and that in bank) is $\frac{474}{1.71 + 1.58} = 144$, as compared with 131 for 1911.

The folding diagram shows graphically the changes in all of the magnitudes in the equation of exchange from 1896 to 1911, as calculated in the *Purchasing Power of Money* and subsequently in the articles in this REVIEW. By folding the diagram in various ways, it is easy to place the balance for 1912 immediately under that for 1896 or any other particular year, and thus make a direct comparison for each of the six magnitudes. Any other two years can also be directly compared with each other in a similar manner.

As to the outlook for the future, I see no reason to change the opinion expressed in the March number, based chiefly on the great expansion of bank deposits, and on the great increase in their velocity of circulation and in the "virtual velocity of money," that we are approaching a crisis, and that this is more likely to begin earlier abroad than at home.

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see the writer's "The 'Scarcity' of Gold" in *Cotton and Finance* for February 15, 1913. See also, for a general statement, Taussig's *Principles of Economics*, vol. I, p. 437.

[5] I take this opportunity to note a misprint in last June's article (AMERICAN ECONOMIC REVIEW, vol. II, p. 312, footnote 16). $MV + M'V'$ should read $MV \div M'V'$.